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Nacre-like alumina: past, present, and future

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1 iLM - L&I - iLM - Liquides et interfaces

2 MATEIS - Matériaux, ingénierie et science

3 LSFC - Laboratoire de Synthèse et Fonctionnalisation des Céramiques

4 SIMaP - Science et Ingénierie des Matériaux et Procédés

5 LGL-TPE - Laboratoire de Géologie de Lyon - Terre, Planètes, Environnement

Nacre-like aluminas are a new class of bioinspired ceramic composites developed over the last few years. These brick-and-mortar composites are obtained by aligning and concentrating alumina platelets and distributing a secondary phase (polymer, ceramic, glass, metal) at the platelets interfaces. The main interest so far of these materials is their damage resistance, resulting mostly from the crack deflection at the platelet/mortar interface. I will discuss the latest processing route developments and our current understanding of the micro- and macro-mechanical properties of these materials, as well as the current challenges and possible applications of these materials.

References:

- A simple approach to bulk bioinspired tough ceramics, H Saad, K Radi, T Douillard, D Jauffrès, CL Martin, S Meille, S Deville, *Materialia* 12, 100807
- Strength and toughness trade-off optimization of nacre-like ceramic composites, K Radi, D Jauffrès, S Deville, CL Martin, *Composites Part B: Engineering* 183, 107699
- Interface failure in nacre-like alumina, R Henry, H Saad, A Doitrand, S Deville, S Meille, *Journal of the European Ceramic Society* 40 (13), 4694-4699
- Effect of microstructure heterogeneity on the damage resistance of nacre-like alumina: insights from image-based discrete simulations, K Radi, H Saad, D Jauffrès, S Meille, T Douillard, S Deville, CL Martin, *Scripta Materialia* 191, 210-214
- Determination of interface fracture properties by micro-and macro-scale experiments in nacre-like alumina, A Doitrand, R Henry, H Saad, S Deville, S Meille, *Journal of the Mechanics and Physics of Solids* 145, 104143